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## What is Claimed:

- 1                   1.       A semiconductor structure comprising:  
  
2                   an insulator layer formed of a first polymer; and  
  
3                   an organic semiconductor layer formed of a second polymer,  
  
4                   wherein the first and second polymers self-assemble into a well-ordered co-  
5                   polymer structure with the semiconductor layer positioned adjacent the insulator layer.
- 1                   2.       The semiconductor structure of claim 1, wherein the co-polymer is a  
2                   block co-polymer.
- 1                   3.       The semiconductor structure of claim 1, wherein the organic  
2                   semiconductor layer comprises carbon-based nanotubes.
- 1                   4.       The semiconductor structure of claim 1, wherein an interface between  
2                   the insulator layer and the organic semiconductor layer is substantially free of  
3                   contamination.
- 1                   5.       The semiconductor structure of claim 1, wherein the structure is a  
2                   lamella structure with the insulator and semiconductor layered in parallel.
- 1                   6.       The semiconductor structure of claim 1, wherein the structure is a  
2                   parallel cylindrical structure with parallel cylinders of the organic semiconductor  
3                   surrounded in a matrix of the insulator.

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1                   7.     The semiconductor structure of claim 1, wherein the structure is a  
2 vertically layered cylindrical structure with cylinders of the organic semiconductor  
3 surrounded in a matrix of the insulator.

1                   8.     The semiconductor structure of claim 1, wherein the structure is a  
2 lamella structure with the insulator and the semiconductor vertically layered in alternate  
3 lamellae of the insulator and the semiconductor.

1                   9.     An organic, thin-film semiconductor device comprising:

2 an insulator layer formed of a first polymer; and

3 an organic semiconductor layer formed of a second polymer,

4 wherein the co-polymers self-assemble into a well-ordered co-polymer  
5 structure with the semiconductor layer positioned adjacent the insulator layer.

1                   10.    The semiconductor device of claim 9, wherein the device is a  
2 transistor.

1                   11.    The semiconductor device of claim 10, wherein the transistor is a  
2 multi-gate transistor.

1                   12.    The semiconductor device of claim 9, wherein the device is a  
2 thyristor.

1                   13.    A process of manufacturing a thin-film organic semiconductor device,  
2 the process comprising:

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3 (a) providing a substrate;

4 (b) applying to the substrate an insulator layer formed of a first polymer and  
5 an organic semiconductor layer formed of a second polymer, wherein the polymers self-  
6 assemble into a well-ordered co-polymer structure with the semiconductor layer positioned  
7 adjacent the insulator layer; and

8 (c) removing parts of the insulator between the organic semiconductor layer,  
9 thereby separating the layers of organic semiconductor.

1 14. The process of claim 13, wherein the co-polymer is a block co-  
2 polymer.

1 15. The process of claim 13, wherein the organic semiconductor layer  
2 comprises carbon-based nanotubes.

1 16. The process of claim 13, wherein an interface between the insulator  
2 layer and the organic semiconductor layer is substantially free of contamination.

1 17. The process of claim 13, further comprising the step of forming at  
2 least one gate electrode on an exposed surface of the insulator layer.

1 18. The process of claim 17, further comprising the step of forming a  
2 source electrode and a drain electrode at the ends of the organic semiconductor layer.

1 19. The process of claim 13, further comprising the step of forming at  
2 least two gate electrodes on an exposed surface of the insulator layer.

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- 1                   20.     The process of claim 19, further comprising the step of separating the  
2     at least two gate electrodes.